

DIGITAL SOLUTIONS

AUG Technical Workgroup of UNCC

Early Engagement Meeting for 2018/19

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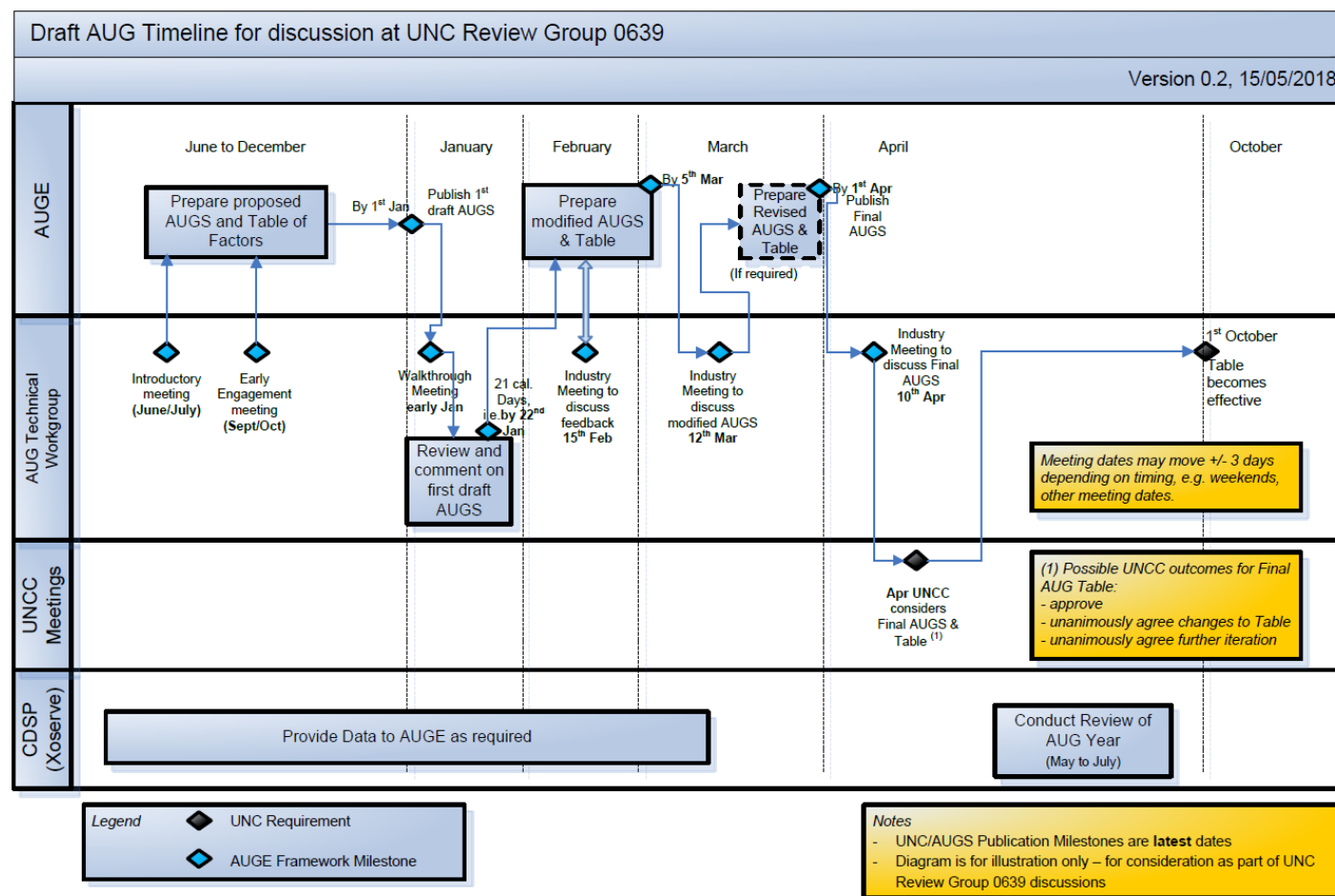
12 October 2018

Agenda

- Introduction
- Data Status
- Analysis Update
 - Review of Issues
 - Proposed Changes to Methodology
 - Additional Data/Information
- Industry Changes and Modifications
- Next Steps

Introduction

■ Mod 0639R – Review of AUGÉ Framework and Arrangements



Data Status

- Register of Data Requests Published on JoT
- Overdue Data Items
 - Shipper Theft of Gas Data
 - Actual Temperature Data
- Risks
 - Supplier Theft of Gas Data not provided in time

Analysis Update

- Update on each Issue
 - Status of analysis and preliminary results
 - Current thoughts on methodology impact
 - Additional supporting data & information required

Theft Analysis (Issue 8)

- Method as presented at the AUG Technical Workgroup meeting
- Generation of best estimate of Unbiased Leads
- Leads → Investigations → Detections

- Supply of data approved in principle at TIG (Theft Issues Group)
- Actual route for data authorisation/supply currently being defined
- Impact assessments
 - received from Experian
 - expected from Crimestoppers by Friday 28 Sep
- Next step – submit paper to TSG

Theft Analysis (Issue 8)

- Summary of data requested:
 - EUC/Product Class
 - Meter Type (traditional/Smart/AMR) – from asset data/serial number
 - Meter installation date - from asset data
 - Source of lead (MAM, MRA, GT, TRAS, own analysis, tip-off)
 - Lead investigated? (Yes/No)
 - Theft detected? (Yes/No)
 - Gas stolen (kWh)
 - Theft type (tampering code)
 - Start and end dates of theft

Theft Analysis (Issue 8)

- Improved approach to estimated theft levels from Smart Meters
- Meter type mappings based on serial number
 - Full data received
 - Example from EA LDZ

ETM	303,203	11.7%
G4	1,197,367	46.1%
R5	61,128	2.4%
Smart	257,344	9.9%
U6	529,992	20.4%
Unknown	246,802	9.5%
Total	2,595,836	100.0%

- If repeated across all LDZs, $\approx 3\text{m}$ Smart Meters identified
- Add to at least 4m now recorded as such in asset data
- Good identification of MPRNs with Smart Meters for theft analysis

Theft from PC2 sites (Issue 14)

- Method as presented at the AUG Technical Workgroup meeting
- Same as used in previous years for PC4
 - Split of Smart and traditional meters
- Will be applied when asset data analysis is carried out
 - This is done a number of times throughout the year
 - When new data received – latest estimates

Improved Consumption Replacement Values (Issue 21)

- What Consumption value to use where no valid meter reads exist?
 - Previously EUC Average
 - Proposed to use interpolation where possible
- Additional Rule Applied
 - When interpolating, consumption values must differ by $<40\%$
 - Guards against significant change in site behaviour/usage

Year	Number of meter points	Consumption change (GWh)
2012	41,453	122.98
2013	33,108	-134.70
2014	43,533	10.00

Volume Conversion (Issues 25 & 29)

Type of Converter

Volume Conversion Approach

Volume (PTZ)

No Conversion Required

Temperature Only

Not Allowed For 01B
Use Site Specific P&Z

No Converter

04B and above, Fixed T, Site Specific P&Z
Below 04B, Standard CF

Volume Conversion (Issues 25 & 29)

- Relies on accurate Pressure, Temperature & CV
- AUGER calculates factors based on **Seasonal Normal Weather**

$$Energy = V_m \times VCF \times ECF$$

$$VCF = \frac{P_m}{P_b} \times \frac{T_b}{T_m} \times \frac{Z_b}{Z_m}$$

$$CF_{press} = \frac{P_m}{P_b} = \frac{(P_{msl} + P_{meter} - A_{meter} \times ACF)}{P_b}$$

$$CF_{temp} = \frac{T_b}{T_m} = \frac{(273.15 + 15)}{(273.15 + T_{meter})}$$

$$\frac{Z_b}{Z_m} \cong 1 \quad (< 2bar)$$

Atmospheric Pressure Sensitivity

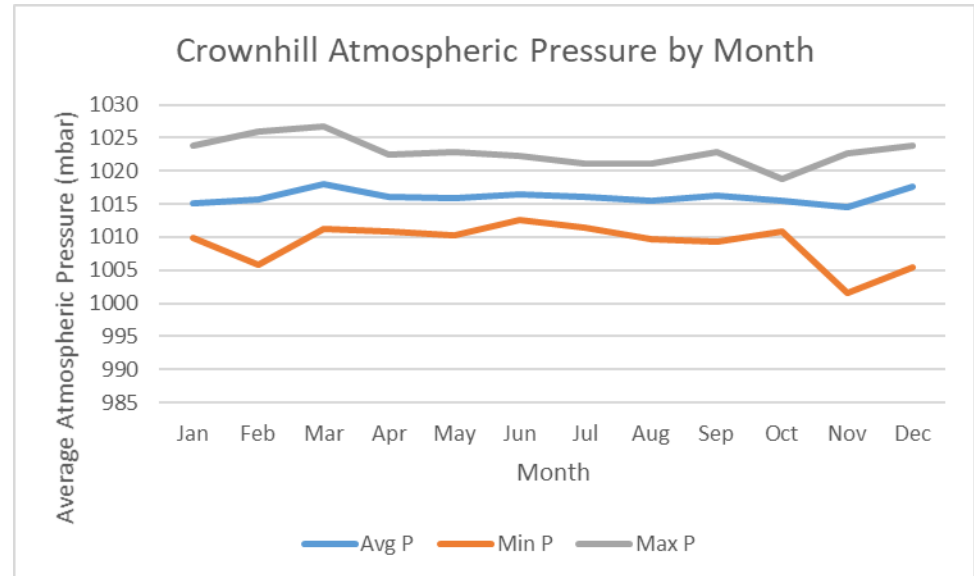
- Assuming meter @67.5m and $P_{msl}=1013.25\text{mbar}$ as base case

$$CF_{press} = \frac{(P_{msl} + 21 - 67.5 \times 0.120208)}{1013.25}$$

- CF_{press} changes by 0.975% per 10mbar change in P_{msl}

Atmospheric Pressure Sensitivity

- Free actual daily atmospheric pressure data (2011-present) for Crownhill, Plymouth
 - <http://www.bearsbythesea.co.uk>
 - $P_{avg}(2011-17)@100m$ is 1016.06mbar
 - $P_{msl}(2011-17)$ is 1028.08mbar
 - No major seasonal variation



- Standard CF too low by 1.45% in this case
 - Expect higher CF further South due to latitude variation
- Will affect all meters without pressure measurement & correction
- Atmospheric pressure more significant at lower metering pressures

Altitude Sensitivity (Pressure)

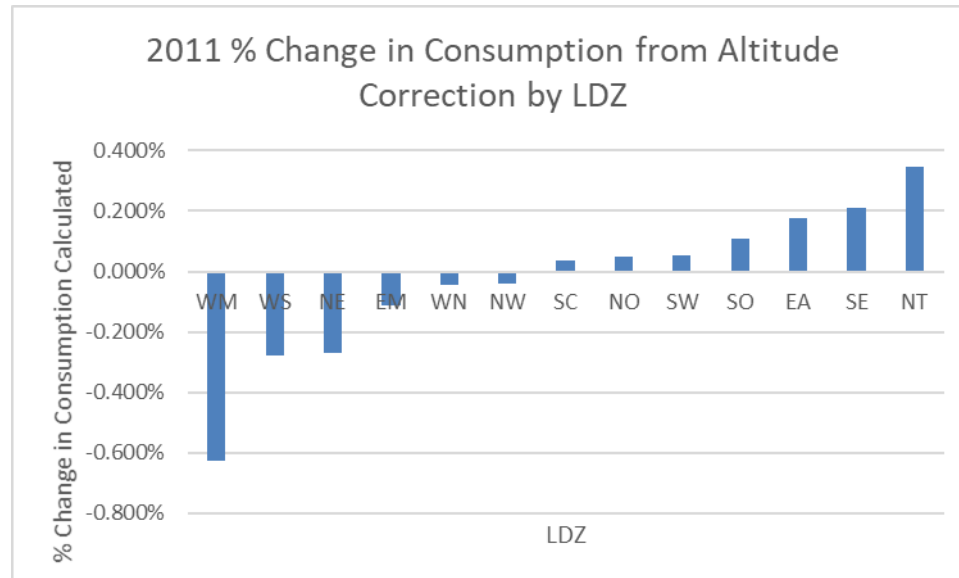
- Assuming meter @67.5m and $P_{msl}=1013.25\text{mbar}$ as base case

$$CF_{press} = \frac{(1013.25 + 21 - A \times 0.120208)}{1013.25}$$

- CF_{press} changes by 0.117% per 10m change in altitude (A)

Altitude Analysis (Pressure)

- Free actual elevation data from OS
 - <https://www.getthedata.com/open-postcode-elevation>
 - Altitude to nearest 10m by postcode
 - Altitude mapped to MPR by CDSP
 - Elevation data available for ~98% of meters
- Consumption calculations for 2011-15 repeated using actual altitudes
- Gas Year 2011 by LDZ
- Average = -0.006%



Altitude Analysis (Pressure)

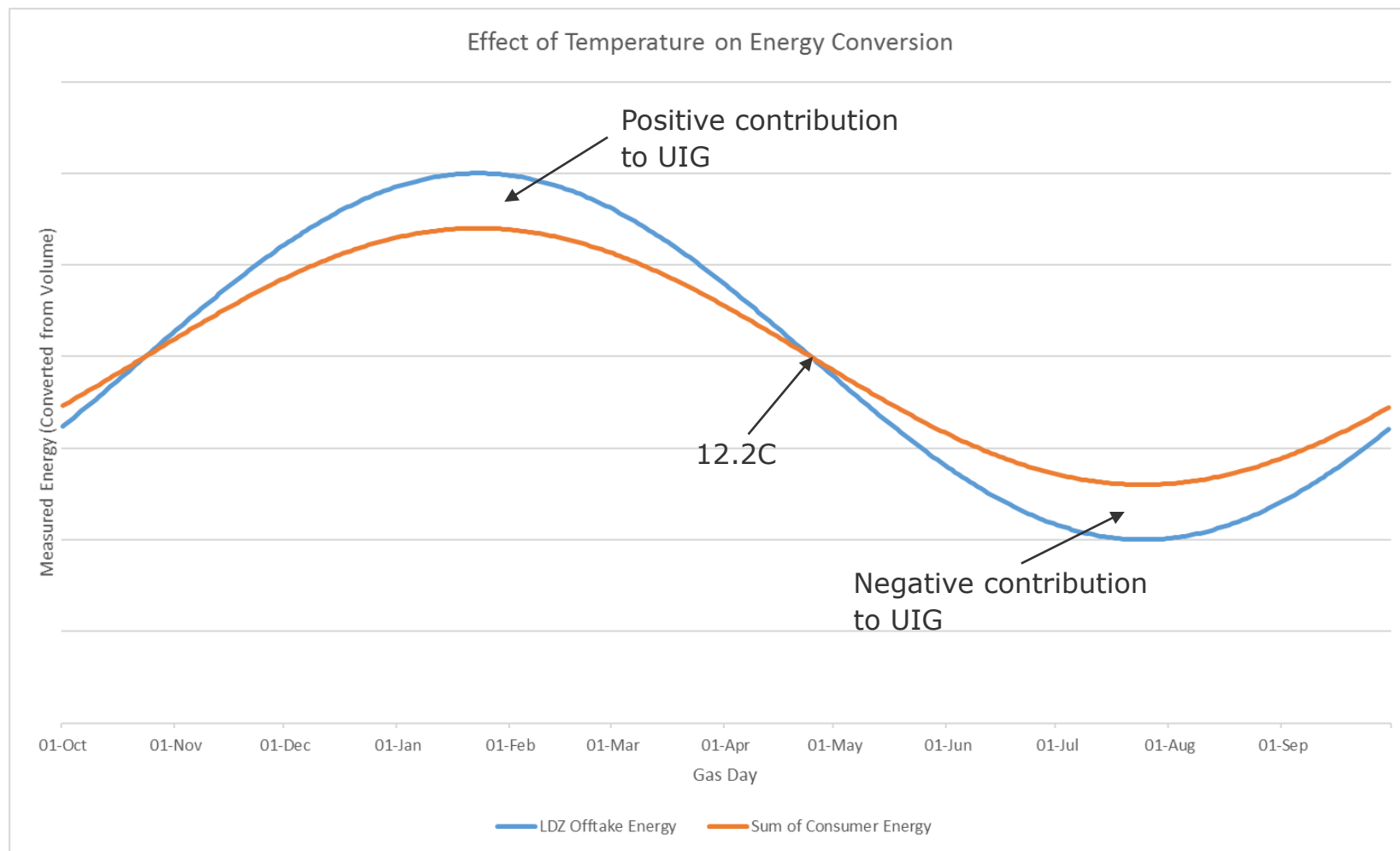
- Difference in calculated consumption for 2011-15
 - Only meters which have standard CF
 - Energy scaled up to allow for non-calcs
- Average Change in Consumption (2011-15) = -16.2GWh
- Excludes CSEPs
- Altitude correction more significant at lower meter pressures
 - What pressures can meters up to EUC03 operate at?
 - Are site specific CFs used in all cases where $P_{\text{meter}} > 21\text{mbar}$?

Gas Year	Consumption % Change
2011	-0.006%
2012	-0.005%
2013	-0.008%
2014	-0.007%
2015	-0.007%
Average	-0.007%

Altitude Analysis (Temperature)

- GTER only include an adjustment for pressure variation with altitude
- Temperature also varies with altitude
 - T decreases by $\sim 0.65^{\circ}\text{C}$ per 100m
 - CF_{temp} changes by $\sim 0.023\%$ per 10m change in Altitude (A)
 - Change due to temperature is about 5x smaller than pressure but in opposite direction

Effect of Temperature on Energy Conversion

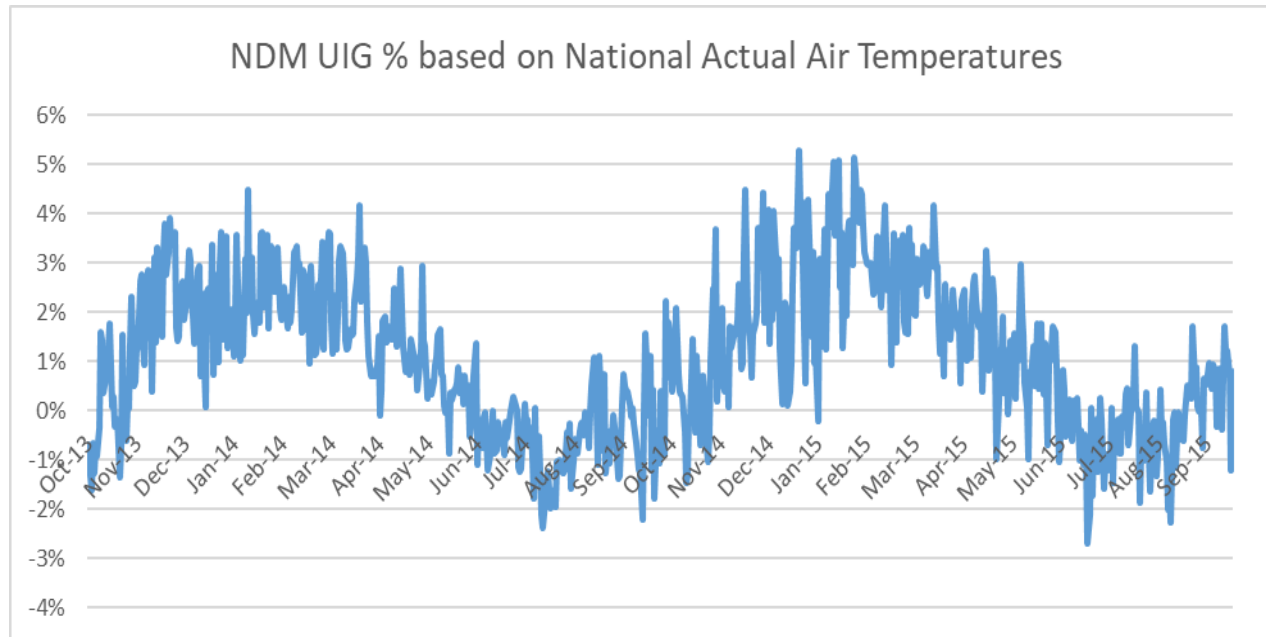


Temperature Sensitivity

- CF_{temp} changes by 0.35% per 1°C change in Temperature
- Considerations
 - CF_{temp} will depend on local weather conditions
 - CF_{temp} will have a seasonal variation
 - CF_{temp} will depend on meter location
 - Affects meters without temperature measurement and conversion
- No robust source of meter temperature information
 - Assumed average temperature of 12.2°C based on sample of real meter temperatures
 - No information on how 12.2°C derived
- Performed some “what if?” scenarios based on available temperature data and some simple assumptions to get ROM estimate of effect
 - Using NDM Allocations only

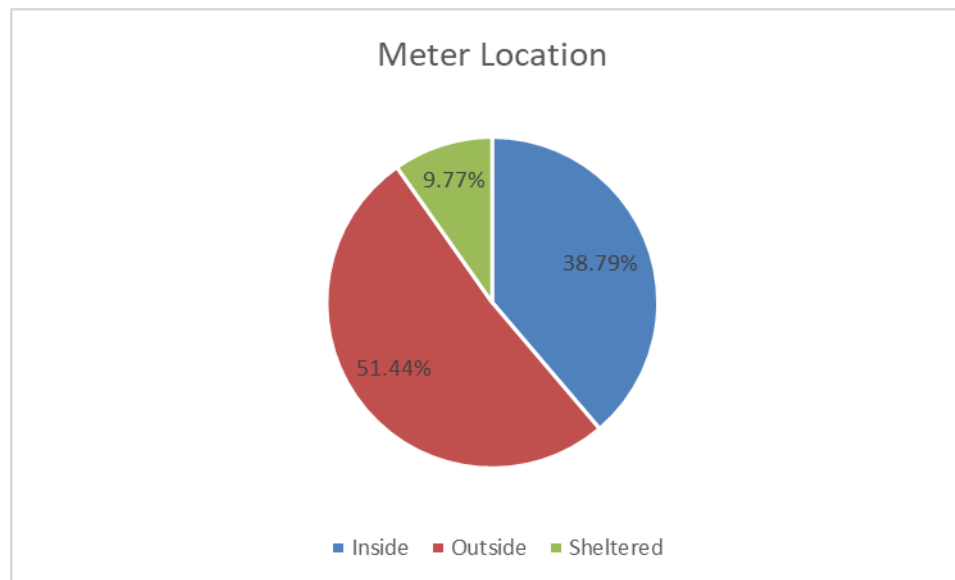
Temperature Sensitivity

- Error in NDM Energy Calculation (UIG) for Gas Years 2013 & 14
 - Based on Actual Daily National Average Air Temperatures from National Grid Website
- Average UIG
 - 2013 1.66%, 2014 2.00%



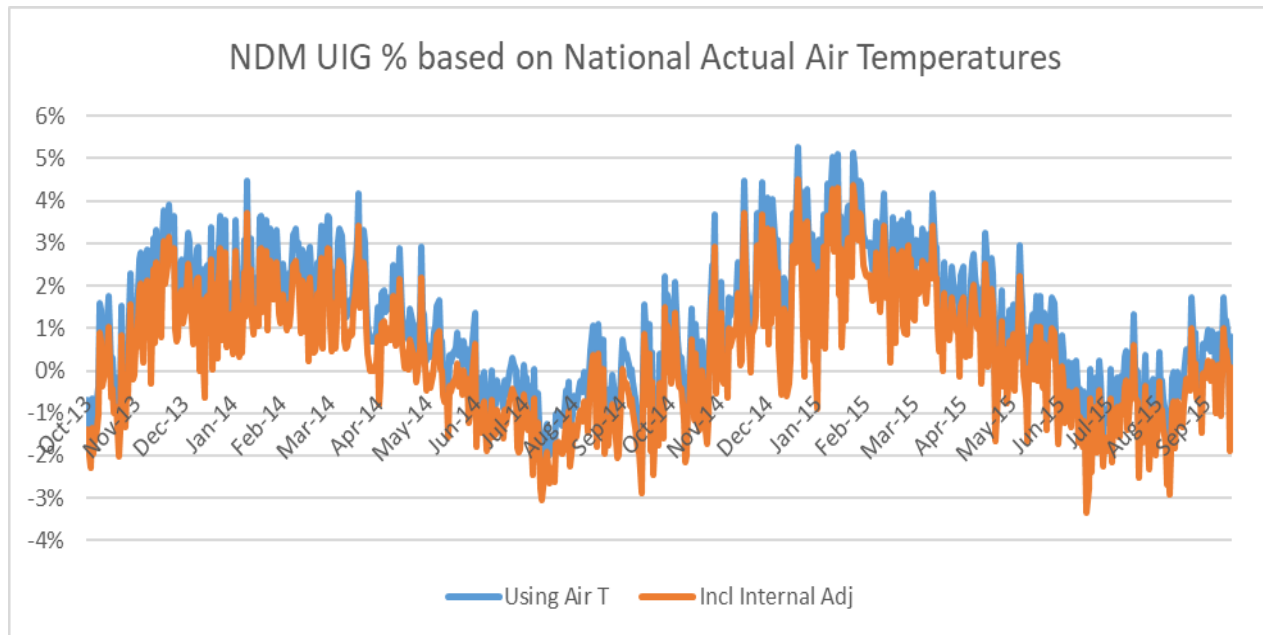
Meter Location

- Meter Location Information available for ~77% of Meters
- Divided into 3 categories
 - Sheltered refers to location in an unheated space e.g. garage or cellar



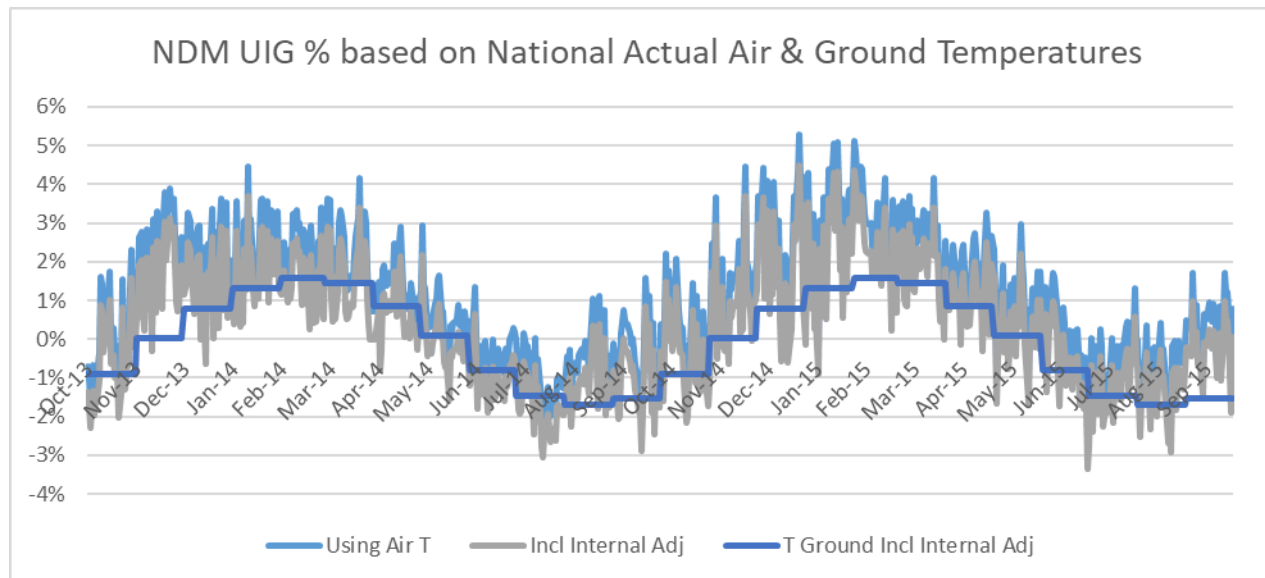
Temperature Sensitivity

- Adjusting Temperature to Allow for Meter Location
 - $T+4^{\circ}\text{C}$ for 50% of meters (internal and sheltered meter locations)
- Average UIG
 - 2013 0.94%, 2014 1.28%



Temperature Sensitivity

- Using Monthly Ground Temperatures
 - Temperature @1.22m, avg 1931-1960 across all LDZs
- Adjusting Temperature to Allow for Meter Location
 - $T+4^{\circ}\text{C}$ for 50% of meters (internal and sheltered meter locations)
- Average UIG
 - 2013 0.52%, 2014 0.54%



Average Temperature Comparisons - Summary

- Large uncertainty around level of meter temperatures
- Current assumption of 12.2°C based on sample of actual measured meter temperatures, including those located indoors

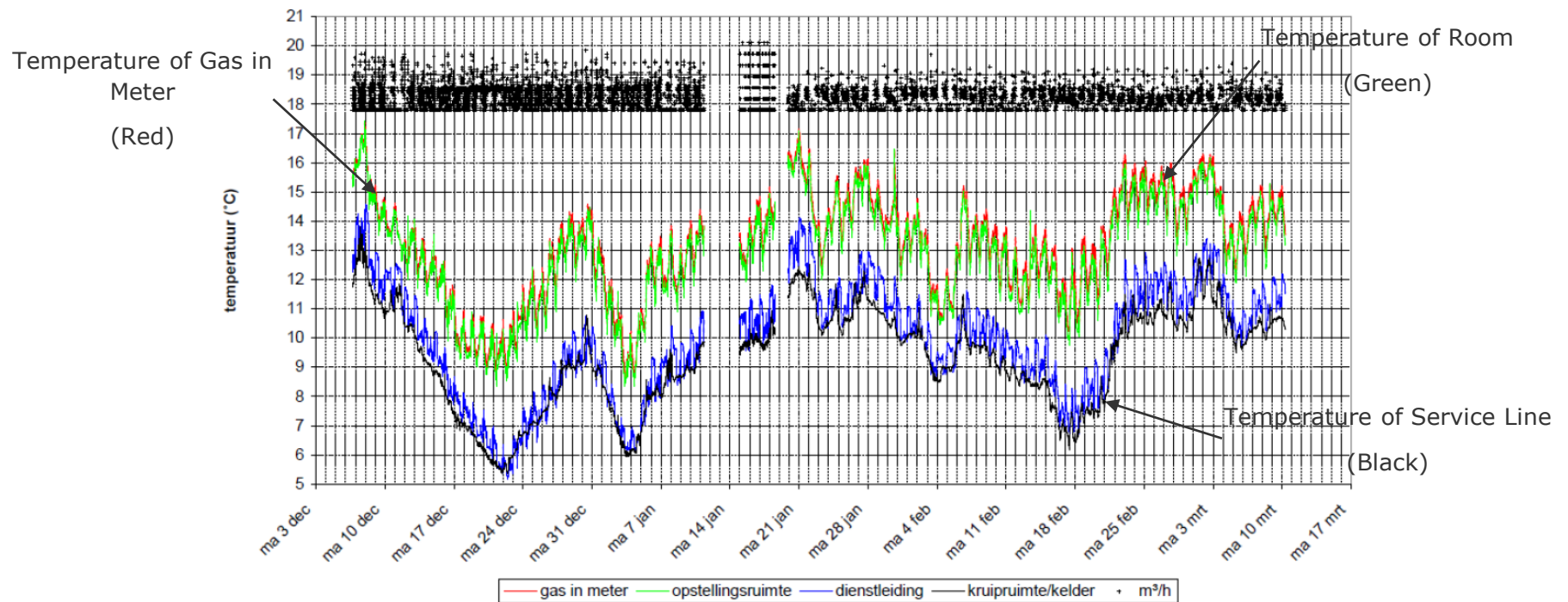
Average Temperatures without any correction for meter location °C

Data Type	2013 AvgT	2014 AvT
National Air Temperature	9.61	8.74
National SNT (Air)	11.39	11.37
Ground Temperature*	10.35	

* 30 year average temperature

Average Temperature Comparisons - Summary

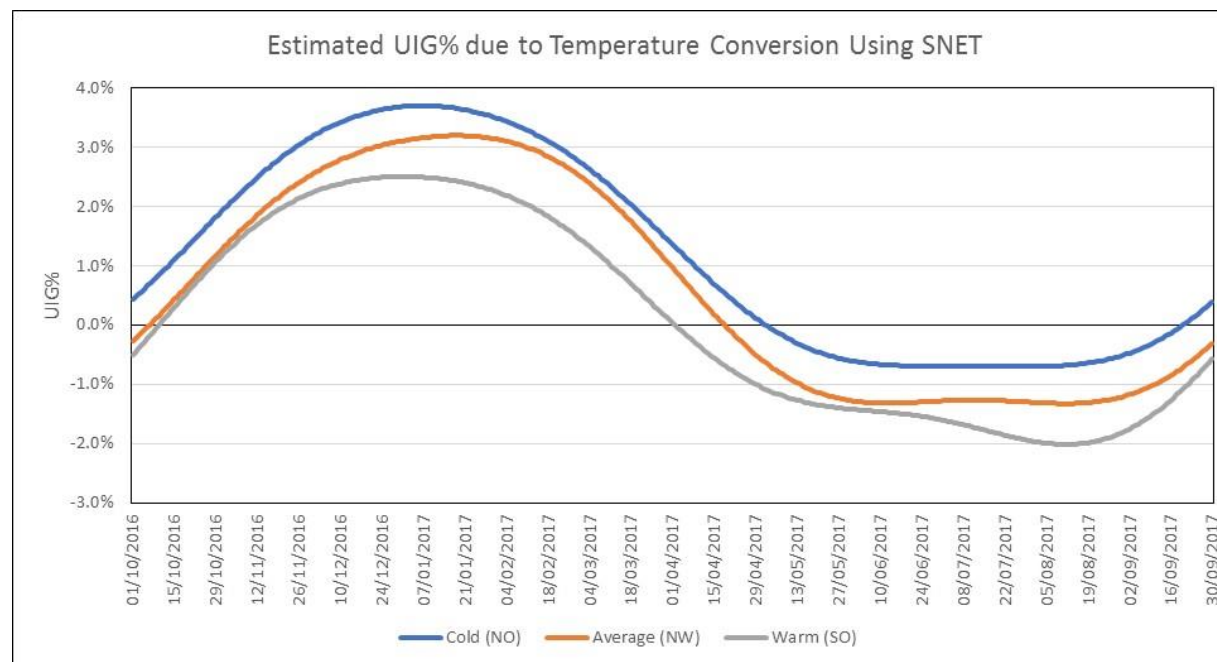
- Meter location adjustment required when calculating meter temperature
 - Gas temperature is significantly higher for meters located indoors



Taken from "Misreading of Conventional Diaphragm Domestic Gas Meter", Rene Hermkens, KIWA Technology, 2012

LDZ Temperature Variation

- CDSP provided SNET (Seasonal Normal Effective Temperature) data for gas year 2016
- Estimated UIG% based on difference in temperature between SNET and 12.2C
- Based on Total NDM Allocation
 - Excludes PC1 post-Nexus



LDZ Temperature Variation

- Average SNET over 2016
 - Between 8.91C and 11.98C
 - Average 10.75C (All LDZs)
- UIG %
 - Between 1.195% and 0.105%
- UIG % when temperature adjusted to allow for Internal Temperatures
 - UIG % between 0.482% and -0.593%
 - Average -0.062% (3 LDZs only)

	Avg SNET	UIG %	UIG % Int Temp
Cold (NO)	8.91	1.195%	0.482%
Average (NW)	10.50	0.631%	-0.074%
Warm (SO)	11.98	0.105%	-0.593%

Volume Converters

- A high % of PC1 & PC2 meters have converters fitted
 - Currently don't have converter types

Product Class	% with Converters
1	79.6%
2	86.8%
3	0.2%
4	0.0%

Key Data

- Information to support assumptions regarding Meter temperatures
 - “Summary Report for Domestic Gas Temperature Survey for Shippers”, 2000
 - “The derivation of LDZ gas temperatures for the period 1996-2000”
- Information on presence of volume converters
 - IGEM/GM/5 provides guidance on where volume conversions systems should be used
 - Usual practice to install PTZ converters above 2.93GWh/annum
 - Details now received from CDSP
- Sample of actual meter temperatures
 - Is this data available from existing conversion systems?
 - Collect new data from sample of meters
 - Could temperature be measured and collected from NDM sample sites?

Proposed Methodology Update

- Additional Directly Calculated UG Component from Volume Conversion
 - Can only be estimated with reliable meter temperature information
- UG from Volume Conversion will be split based on throughput
 - Only for relevant meters

Incorrect Site Specific CF (Issue 26)

- Updated meter asset data was received in September
- Initial analysis shows that there are still a small number of sites with suspicious correction factors
 - E.g. 0.02264
- The number appears to be very small, but the AUGE proposes to update the calculation methodology to revert to using the standard correction factor when the value in the asset data lies outside of a sensible range.
 - Range boundaries – to be determined and will depend on meter pressure information

Standard CF for 04B and Above (Issue 27)

- Initial analysis of the latest meter asset data set shows approx. 10% are using the standard correction factor.
- The average site specific correction factor is approx. 1.0453 which is 2% higher than the standard factor.
- This suggests a potential impact of around 100GWh.

Accuracy of Volume Converters (Issue 28)

- Standards
 - IGEM/GM/5 Edition 3 “Electronic gas volume conversion systems”
 - BS EN 12405: 2002 “Gas-volume electronic conversion devices”
 - Pressure +/-0.5%, Temperature +/-2C
 - Transco T/SP/PRS/26, “Specification for Gas-Volume Electronic Conversion Devices”, August 2004
- Possible error due to incorrect config – sample data?
- National Grid policy T/PL/ME/16 “Policy for the Removal/Replacement of Obsolete Volume Conversion Devices”
 - Metering policy identifies obsolete converters
- Any reports from monitoring, validation?

CV Inaccuracy (Issue30)

- Investigations ongoing, no results to present

Movements Between Product Classes (Issue 31)

- The rate of movement between Product Classes is not constant over time
- Snapshots of Product Class populations over time
 - Provided by Xoserve
 - From Nexus go-live onwards
- Rate of change tracked over time
 - Extrapolate to forecast year
- Used to derive best estimate of Product Class populations for forecast year

Permanent UIG Post-Nexus (Issue 33)

- Analysis not started
 - Post-Nexus data received
 - Requested Pre-Nexus reconciliation data and simulated UIG

New Issues Status

- Initial Analysis & Prioritisation Required
 - UIG from Meter Change (Issue 35)
 - Isolated Supply Points with Incrementing Reads (Issue 36)
 - Discrepancies in Converted Reads (Issue 37)

Industry Changes and Modifications

- 0654S Mandating the provision of NDM sample data
- 0658 CDSP to identify and develop improvements to LDZ settlement processes
- 0659S Improvements to the Composite Weather Variable
- 0664 Transfer of Sites with Low Read Submission Performance from Class 2 and 3 into Class 4

Summary of Proposed Changes to Methodology

- Methodology Updates
 - Alternative Replacement Values in Consumption Calculation
 - Volume to Energy Conversion*

- Areas Under Investigation
 - Theft
 - Theft from PC2 Sites (ex DME/DMV)
 - UG from Meter Change
 - Incrementing Reads for Isolated Supply Point
 - Discrepancies between Converted & Unconverted Meter Reads

* Methodology to be updated but change in factors subject to data availability

Next Steps

- AUGE to publish draft AUG Statement – 1st Jan 2019
- Any Feedback?

Thank you

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